

ELECTRICAL ENERGY STORAGE

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**ENERGY STORAGE LINKS
INTERMITTENT GENERATION
TO VARIABLE LOADS**

HOW?

**PUMPED HYDRO
COMPRESSED AIR
BATTERIES
FLYWHEELS
SMES**

BATTERIES:

LEAD ACID, VRLA

ZnBr, NaBr, VanadiumRedox

NiCd, NaS

POWER ELECTRONICS

MUST BE

INTEGRAL PART OF

STORAGE SYSTEM!

WHY?

**RENEWABLES
LOAD LEVELING
PEAK SHAVING
NET STABILITY
POWER QUALITY**

**ENERGY STORAGE MAKES
INTERMITTENT RENEWABLES
DISPATCHABLE**

EXAMPLE:

**A COMMUNITY THEATER
NEAR WASHINGTON
70 KW PHOTOVOLTAIC ARRAY
+ 200 KW / 200 KWh
ZnBr BATTERY**

VILLAGE POWER

LOAD LEVELING
ALLOWS OPTIMIZATION
OF GENERATION

EXAMPLE:

METLAKATLA, ALASKA

A SMALL ISLAND GRID

**1 MW / 1.4 Mwh VRLA BATTERY
WITH HYDRO POWER
CORRECTS
POWER DISTURBANCES
FROM SAWMILL
AND ELIMINATES
DIESEL GENERATION
(400 000 gallons = 350k\$ SAVED)**

ENERGY STORAGE
PROVIDES SPINNING RESERVE
AND GRID STABILITY

EXAMPLE:

PUERTO RICO

20 MW / 14 Mwh LA BATTERY

PREVENTS BLACKOUTS.

20 MW MORE APPROVED

**INCREASING IMPORTANCE
OF ELECTRONIC PRODUCTION
LINES MAKES
POWER QUALITY CRITICAL**

SEMICONDUCTOR INDUSTRY:

A SINGLE 5 second OUTAGE

CAN MEAN a \$12 million LOSS

**MORE THAN THE ENTIRE COST
OF ENERGY FOR A YEAR!**

EXAMPLE:

**1 MW / 15 second LA BATTERY
TRAILER MOUNTED
FOR LARGE PLASTICS PLANT
YIELDS PREMIUM POWER
(NO SAGS, MICRO OUTAGES)
WITH ONE YEAR PAYBACK!**

ENERGY STORAGE:

- **MAKES RENEWABLES PRACTICAL**
- **OPTIMIZES GENERATION THROUGH LOAD SHIFTING**
- **INCREASES PRODUCTIVITY THROUGH PQ CONTROL**

ENERGY STORAGE:

COST EFFECTIVE TECHNOLOGY

READY TO USE!